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Attention of: Valorie A. Burr
Greenbelt, MD 20771

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Submitted by: The Trustees of Columbia University
in the City of New York
Box 20, Low Memorial Library
New York, New York 10027

Prepared by: Columbia Astrophysics Laboratory
Departments of Astronomy and Physics
Columbia University
538 West 120th Street
New York, New York 10027

Title of Research: **"X-ray Quasi-Periodic Oscillations in AM Herculis Stars"**

Principal Investigator: Joseph Patterson
Associate Professor of Astronomy

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In theory, experimental evidence on the stability of accretion shocks in radially accreting, magnetic white dwarfs (AM Herculis stars) can be gained by studying their X-ray light curves. A series of papers in the early 1980s by Langer, Chanmugam, and Shaviv predicted that the shocks should be unstable, with the shock height varying by factors of 10 on timescales of a few seconds (the dynamical timescale at the base of the accretion funnel). Several detections of optical quasi-periodic oscillations on timescales of 1-2 seconds were made by Middleditch and Larsson, providing some confirmation of the theory. However, most of the optical light originates farther upstream in the funnel, and it is by no means obvious that we can associate it with the shocked gas. In principle, there appear to be two ways of resolving this uncertainty:

(1) Use the eclipse geometry of individual systems, when known (which it usually isn't) to diagnose the location of the pulsating light source.

(2) Observe at a wavelength which can only come from the accretion shock, viz. X-rays.

We have chosen the second of these alternatives, and spent a year searching for pulsations in the X-ray light curves obtained by the *Einstein Observatory*. *We found no convincing evidence for the pulsations.* Because the signals are not expected to be coherent (the known optical signals fall apart in phase in a few cycles), it's hard to express the pulse fraction upper limits. They're typically around 50% for a signal with a coherence comparable to that seen in the optical light of VV Puppis, AN Ursae Majoris, and E1405-451. This number is of certainly of some interest, at least for the simple model of dipolar or monopolar accretion flow onto the white dwarf. The big caveat in the interpretation is this: what happens if the flow occurs along many flux tubes with very different accretion rates in each tube? The "soft X-ray puzzle" in AM Her stars has tended to favor this model, and if it's correct, then pulsations may not say anything about stability, but merely reflect variations in the way in which accreting gas is parcelled out to the various flux tubes.

The results are being written up for publication now. We are somewhat slowed by the difficulties of characterizing upper limits for a signal whose coherence is not known in advance. (For example, for a sufficiently incoherent signal the appropriate limit must be 100%, there being enough power in the continuum to allow such a signal; that would not be very interesting.) We will need to develop some mathematical framework to complete this presentation.

In the *Einstein IPC* observations, EF Eridani (=2A0311-227) is clearly the best star, there being an abundance of soft and hard X-ray photons to study. But in future work, VV Puppis and CW1103+254 are the ideal candidates for a long X-ray observation and analysis of this type. They are both strong soft X-ray sources, enabling a sensitive pulsation search, and the eclipse geometry (as the white dwarf rotates) affords a straightforward opportunity to test the geometrical origin of the X-rays in the binary.